



TENNESSEE DEPARTMENT OF

EDUCATION

FIRST TO THE TOP

Science of Technology (PLTW)

Primary Career Cluster:	Science, Technology, Engineering, and Mathematics (STEM)
Consultant:	Bethany King Wilkes, (615) 532-2844, Bethany.Wilkes@tn.gov
Course Code:	TBD
Prerequisite(s):	None
Credit:	N/A
Grade Level:	8
Graduation Requirement:	N/A
Coursework and Sequence:	This is the third course in the <i>Project Lead the Way (PLTW)</i> middle school sequence of coursework.
Necessary Equipment:	Visit www.pltw.org for more information.
Aligned Student Organization(s):	Technology Student Association (TSA): http://www.tntsa.org Amanda Hodges, (615) 532-6270, Amanda.Hodges@tn.gov
Coordinating Work-Based Learning:	N/A
Available Student Industry Certifications:	N/A
Dual Credit or Dual Enrollment Opportunities:	N/A
Teacher Endorsement(s):	001, 013, 014, 015, 016, 017, 018, 047, 070, 078, 081, 101, 210, 211, 212, 213, 214, 230, 231, 232, 233, 400, 401, 402, 413, 414, 415, 416, 417, 418, 440, 470, 477
Required Teacher Certifications/Training:	<i>Project Lead the Way</i> training is required
Teacher Resources:	http://www.tn.gov/education/cte/doc/STEMResourceList.pdf

Course Description

This is a course in the series of *Project Lead the Way (PLTW)* curriculum. For more information, visit the PLTW website at <http://www.pltw.org/>.

Program of Study Application

These courses build knowledge and skills related to the following career clusters:

- 1) Architecture & Construction
- 2) Information Technology (IT)
- 3) Manufacturing
- 4) Science, Technology, Engineering & Mathematics (STEM)
- 5) Transportation, Distribution, & Logistics

Course Standards

The course standards outlined below are the copyrighted property of *Project Lead the Way*. Teachers must participate in *Project Lead the Way* training in order to be able to teach this course.

Lesson 5.1 Applied Chemistry (6 days)

Understandings

- 1) Chemical engineering is concerned with design, construction and operation of machines that perform chemical reactions, separations or mixes, and fluid flow to solve problems and make useful products.
- 2) Chemical engineers apply the knowledge and discoveries of a chemist to solve real life problems.
- 3) Chemical engineers work in many industries including manufacturing, pharmaceuticals, healthcare, environmental, materials, and alternative energy.
- 4) Chemical engineers often work on teams with other engineers, scientists, and technologists

Knowledge and Skills

It is expected that students will:

- Describe the difference between a chemist and a chemical engineer.
- Describe how salt affects the melting point of ice.
- Describe how an adhesive bond holds two items together.
- Outline the steps required to clean up an oil spill.
- Apply science and engineering skills to make ice cream.
- Utilize the steps of the design process to create product.
- Work as a part of a team to solve an oil spill engineering simulation problem.

Lesson 5.2 Nanotechnology (10 days)

Understandings

- 1) Nanotechnology is building innovative tools to study and manipulate objects at the nanometer scale, one billionth of a meter.
- 2) Properties of materials, such as strength, color, and resistance can be changed by nanotechnology.
- 3) Molecules can be arranged using nanotechnology in a way that they do not normally occur in nature.
- 4) Nanotechnology will have an impact on many areas, including but not limited to electronics and computing, materials, manufacturing, energy, environment, health, medicine, national security, and space exploration.
- 5) Scanning Probe and Atomic Force microscopes are used to see and move individual atoms.



- 6) Engineers, designers, and engineering technologists are needed in high demand for the development of future technology to meet societal needs and wants.

Knowledge and Skills

It is expected that students will:

- Identify facts regarding nanotechnology including properties of materials at nanoscale.
- Describe the relative size of a nanometer.
- Describe how nano-products are used in society today.
- Identify tools and processes used to see and manipulate matter at the nanoscale.
- Discuss the impact that nanotechnology has on their lives today and will have in the future.
- Identify examples of nanotechnology-enhanced products.
- Describe engineering and engineering technology careers related to the advancement of nanotechnology.

Lesson 5.3 Applied Physics (29 days)

Understandings

- 1) Simple machines can make work easier by increasing mechanical advantage.
- 2) Mechanical advantage is the ratio of the force produced by a machine to the force applied to the machine.
- 3) Compound machines are made from a combination of several simple machines.
- 4) Energy cannot be created or destroyed but may be transferred into different types of energy.
- 5) Humans use their energy, along with simple machines, to do work by changing the state of energy of an object from potential to kinetic.
- 6) Prototyping is an important step in the design process and provides the designer with a scaled working model that can be used for testing.

Knowledge and Skills

It is expected that students will:

- Identify the six simple machines: the lever, pulley, wheel and axle, inclined plane, wedge, and screw.
- Identify a machine as something that helps use energy more efficiently.
- Describe work as the force applied over a distance.
- Explain the applications of the six simple machines.
- Distinguish between the three classes of levers.
- Determine mechanical advantage from assembled simple machines.
- Compare and contrast kinetic and potential energy.
- Predict the relative kinetic energy based on the mass and speed of the object.
- Recognize and demonstrate safety rules for using lab tools and machines.
- Build, test, and evaluate a model of a design problem.
- Analyze a product through testing methods and make modifications to the product.

